

In the Claims

This listing of claims will replace all prior versions and listings of claims in the application:

1 1. (Currently Amended) A method of ~~time scale modification~~
2 ~~of a~~ converting an input digital audio signal into an output
3 digital audio signal having a modified time scale comprising the
4 steps of:

5 calculating a discrete Fourier transform of first equally
6 spaced, overlapping time windows having a first overlap amount of
7 the input digital audio signal;

8 partitioning the spectrum into a plurality of contiguous
9 spectral bands according to a Bark scale where each spectral band
10 has an extent dependent upon human frequency perception;

11 identifying a dominant spectral line having the greatest
12 magnitude within each spectral band;

13 calculating a phase difference for the dominant spectral line
14 of each spectral band by a phase vocoder algorithm;

15 calculating a phase difference for each of a predetermined
16 number of spectral lines near the dominant spectral line within
17 each spectral band as the phase difference of the corresponding
18 dominant spectral line;

19 calculating a phase difference for other spectral lines of
20 each spectral band by the phase vocoder algorithm; and

21 calculating an inverse discrete Fourier transform resulting in
22 equally spaced, overlapping time windows having a second overlap
23 amount employing the calculated phase difference for each spectral
24 line thereby producing the output digital audio signal, the second
25 overlap selected having a ratio to the first overlap amount to
26 achieve a desired time scale modification.

1 2. (Original) The method of claim 1, wherein:

2 the predetermined number of spectral lines near the dominant
3 spectral line is 4 for a 1024-point spectrum.

1 3. (Original) The method of claim 1, further comprising the
2 step of:

3 merging nearby spectral lines that are within a predetermined
4 frequency range of each other prior to calculating the phase
5 difference.

1 4. (Original) The method of claim 1, wherein:
2 said step of partitioning the spectrum into a plurality of
3 contiguous spectral bands according to a Bark scale employs
4 predetermined spectral bands unrelated to the digital audio signal.

1 5. (Original) The method of claim 1, wherein:
2 said step of partitioning the spectrum into a plurality of
3 contiguous spectral bands according to a Bark scale includes
4 adjusting boundaries of spectral bands to maintain important
5 frequency groups within the same spectral band.

1 6. (Original) A digital audio apparatus comprising:
2 a source of a digital audio signal;
3 a digital signal processor connected to said source of a
4 digital audio signal programmed to perform time scale modification
5 on the digital audio signal by

6 calculate a discrete Fourier transform of first equally
7 spaced, overlapping time windows having a first overlap
8 amount,

9 partition the spectrum into a plurality of contiguous
10 spectral bands according to a Bark scale where each spectral
11 band has an extent dependent upon human frequency perception,
12 identify a dominant spectral line having the greatest

13 magnitude within each spectral band,
14 calculate a phase difference for the dominant spectral
15 line of each spectral band by a phase vocoder algorithm,
16 calculate a phase difference for each of a predetermined
17 number of spectral lines near the dominant spectral line
18 within each spectral band as the phase difference of the
19 corresponding dominant spectral line;
20 calculate a phase difference for other spectral lines of
21 each spectral band by the phase vocoder algorithm, and
22 calculate an inverse discrete Fourier transform using
23 equally spaced, overlapping time windows having a second
24 overlap amount employing the calculated phase difference for
25 each spectral line thereby forming a time scale modified
26 digital audio signal, the second overlap selected having a
27 ratio to the first overlap amount to achieve a desired time
28 scale modification; and
29 an output device connected to the digital signal processor for
30 outputting the time scale modified digital audio signal.

1 7. (Original) The digital audio apparatus of claim 6,
2 wherein:
3 the predetermined number of spectral lines near the dominant
4 spectral line is 4 for a 1024-point spectrum.

1 8. (Original) The digital audio apparatus of claim 6,
2 wherein:
3 said digital signal processor is further programmed to merge
4 nearby spectral lines that are within a predetermined frequency
5 range of each other prior to calculating the phase difference.

1 9. (Original) The digital audio apparatus of claim 7,
2 wherein:

3 said digital signal processor is programmed to partition the
4 spectrum into a plurality of predetermined spectral bands according
5 to the Bark scale unrelated to the digital audio signal.

1 10. (Original) The digital audio apparatus of claim 1,
2 wherein:

3 said digital signal processor is programmed to partition the
4 spectrum into a plurality of contiguous spectral bands by adjusting
5 boundaries of spectral bands to maintain important frequency groups
6 within the same spectral band.